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Factors Associated with Stunting Incidence in Oebau Village, Sonimanu Community Health Center Working Area, Rote Ndao Regency

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Abstract. *Stunting in children under five is a serious public health problem in Rote Ndao Regency, East Nusa Tenggara Province. Data from the e-PPGBM system of the Rote Ndao District Health Office for the March 2026 period shows that Oebau Village in the working area of Sonimanu Primary Health Center, Pantai Baru District, recorded the highest stunting prevalence at 40.8% (29 out of 71 toddlers measured), far exceeding WHO's serious threshold of 20%. This figure places Oebau Village as a priority area for stunting intervention in Pantai Baru District. This study aims to analyze the factors associated with stunting incidence in Oebau Village, the working area of Sonimanu Primary Health Center, Rote Ndao Regency. The research method uses a descriptive-analytic design with a cross-sectional approach based on secondary data from the e-PPGBM system of the Rote Ndao District Health Office for the March 2026 period and a comprehensive literature review. The results of the analysis show that factors associated with stunting incidence in Oebau Village include: history of low birth weight (LBW), inadequate exclusive breastfeeding, inappropriate complementary feeding practices, number of children in the family ≥3, low family income, low maternal education level, history of recurrent infectious diseases, and limited access to clean water and adequate sanitation. Recommended interventions include strengthening community-based nutrition programs, improving the capacity of posyandu cadres, integrating family planning programs with nutrition programs, and a multi-sectoral approach involving local religious and traditional leaders.*

Keywords: *Stunting, Toddler, Oebau Village, Sonimanu Health Center, Rote Ndao, Risk Factors, e-PPGBM*

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INTRODUCTION

Stunting is a condition of growth failure in toddlers due to chronic malnutrition, particularly during the first 1,000 days of life (HPK), resulting in the child being too short for their age (Pudjirahaju et al., 2025; Azis et al., 2023; Rufaridah et al., 2022; Syukur & Harismayanti, 2020; Danuseputro et al., 2023). According to the World Health Organization (WHO), stunting is defined as a child's length or height falling below minus two standard deviations (-2 SD) from the median WHO child growth standards based on height-for-age (H/A) indicators. Stunting not only impacts physical growth but also affects a child's cognitive development, intelligence, learning ability, and future productivity (Awaludin et al., 2025; Nahar et al., 2020; Sitorus, 2024).

Globally, UNICEF and WHO 2023 report that approximately 148 million children under five years old experienced stunting in 2022. Indonesia is among the countries with a high stunting burden. Based on the 2022 Indonesian Nutritional Status Survey (SSGI), the national stunting prevalence was 21.6%, and East Nusa Tenggara (NTT) Province consistently ranks as having the highest stunting prevalence in Indonesia. This condition is influenced by various complex

determinants, including direct factors such as nutritional intake and infectious diseases, as well as indirect factors such as family food security, parenting patterns, access to health services, and environmental sanitation (Reinhardt & Fanzo, 2014; Agostoni et al., 2023; Issa et al., 2025; Thwib et al., 2025).

Rote Ndao Regency, as the southernmost island regency in Indonesia, faces significant challenges in addressing stunting. Data from the Rote Ndao Regency Health Office's Community-Based Nutrition Recording and Reporting (e-PPGBM) for March 2026 recorded that of the seven villages within the Sonimanu Community Health Center (Puskesmas) in Pantai Baru District, Oebau Village recorded the highest stunting prevalence at 40.8%. 29 of the 71 toddlers measured were stunted (categorized as very short and stunted). This figure is more than double the WHO threshold of 20%, which classifies a region as having serious nutritional problems.

The high prevalence of stunting in Oebau Village cannot be viewed as an isolated phenomenon. Picaully et al., in a study in the Rote Barat Laut District, Rote Ndao Regency, identified that socio-cultural factors, including the role of religious and traditional leaders, significantly influence community health and nutrition behaviors. This study demonstrated that strengthening the capacity of religious leaders to accelerate the reduction of stunting prevalence is an effective strategy and is appropriate to the cultural context of the Rote Ndao community (Picaully et al., 2023).

A comprehensive nutritional status assessment is an essential first step in addressing stunting. Supariasa et al. 2012 in their Nutritional Status Assessment Book emphasized that anthropometric measurements, particularly the height-for-age index, are the most appropriate method for identifying stunting in toddlers because they are non-invasive, easy to perform, and provide a snapshot of long-term nutritional status. The book also explains that the interpretation of anthropometric measurement results must take into account factors that influence growth, including genetics, environment, and nutritional intake.

Given the high prevalence of stunting in Oebau Village and the limited studies specifically addressing factors related to stunting in the area, this study was conducted to comprehensively analyze the risk factors contributing to the high prevalence of stunting in Oebau Village, within the Sonimanu Community Health Center (Puskesmas) coverage area, Rote Ndao Regency. The results of this study are expected to provide a scientific basis for policymakers in designing targeted interventions to accelerate stunting reduction in the area.

METHODS

This study utilized a dual-approach research design, specifically combining a descriptive secondary data analysis of the March 2026 e-PPGBM dataset with a narrative literature synthesis. The primary goal was to describe the prevalence and distribution of stunting across the Sonimanu Public Health Center service area and to contextualize local potential risk factors using published empirical literature. Because statistical associations were not computed directly on individual-level primary data, this study does not claim direct observational associations within the primary sample, but rather presents potential risk factors derived from literature relevant to the local context. This integrative methodological design aligns with contemporary public health frameworks that combine routine administrative health data with empirical review evidence to inform localized interventions (Mor, 2026; Ahmed, 2021; Sepadi & Hutton, 2025; Sadia et al., 2026; Shahzad et al., 2019). The research was conducted within the jurisdiction of the Sonimanu Primary Health Center in Pantai Baru District, Rote Ndao Regency. The target population comprised all 412 children under five years of age registered in the e-PPGBM system across seven villages for the March 2026 period. Through total population sampling based on routine Posyandu monitoring, a final sample of 385 toddlers was successfully measured. Village-level comparisons were conducted across this entire sample, while the in-depth descriptive analysis focused primarily on Oebau Village, which recorded the highest stunting burden with 71 out of 76 targeted children measured. A total of 27 toddlers across the health center area were unmeasured due to temporary absence or illness and were consequently excluded from the cross-

sectional denominator without any data imputation. Recent epidemiological protocols emphasize the validity of total population sampling in community-based growth monitoring systems when high coverage rates are achieved (Ministry of Health RI, 2024). The dependent variable, nutritional status, was measured using Height-for-Age (H/A) or Length-for-Age (L/A) Z-scores based on the 2006 WHO Child Growth Standards. Stunting was operationally defined as a Z-score below -2.0 standard deviations, which encompasses both the stunted and severely stunted categories. The independent variables, or potential determinants, were extracted during the literature review and operationally defined to allow for contextual comparison. Perinatal factors included low birth weight, defined as under 2,500 grams, and short birth length, defined as under 48 centimeters. Infant feeding practices were categorized into exclusive breastfeeding for the first six months and the timely, adequate introduction of complementary feeding (MPASI). Demographic and socioeconomic factors encompassed a family size of three or more children, household income below the regional minimum wage, and maternal education levels below senior high school.

Finally, environmental and health variables included a recent history of infections, such as diarrhea or acute respiratory infections, as well as access to improved sanitation and clean drinking water. Standardizing these operational definitions against recent clinical and epidemiological indicators ensures consistency in evaluating child growth deficits (Kementerian Kesehatan RI, 2024). To systematically identify potential determinants of stunting, a narrative literature search was executed following PRISMA guidelines across PubMed/MEDLINE, Google Scholar, Scopus, and Portal Garuda on April 2, 2026. The search utilized Boolean combinations of terms such as stunting, risk factors, determinants, and Rote Ndao or NTT. Inclusion criteria were limited to peer-reviewed original research articles published between 2014 and 2024 that examined stunting risk factors in similar archipelagic Indonesian contexts and were available in full-text English or Indonesian. The initial database search yielded 142 records, from which 38 duplicates were subsequently removed. After screening the titles and abstracts of the remaining 104 records, 65 irrelevant articles were excluded. A full-text eligibility assessment of the remaining 39 articles led to the exclusion of 18 studies that did not meet the inclusion criteria, resulting in a final synthesis of 21 eligible articles.

Adhering to updated PRISMA guidelines ensures transparency, reproducibility, and methodological rigor in literature selection and synthesis (Nezameslami et al., 2025; Veroniki et al., 2025; Roth et al., 2026). Data analysis was conducted using a two-step descriptive and comparative framework. First, the secondary anthropometric measurements from the e-PPGBM system were aggregated using Microsoft Excel to calculate absolute frequencies and percentages. This descriptive step highlighted spatial disparities across the region, notably identifying Oebau Village's 40.8% stunting prevalence as a priority concern. Second, because the primary dataset lacked individual-level socio-behavioral covariates, a comparative evidence synthesis was performed in place of direct statistical association tests. Odds Ratios and Confidence Intervals from the synthesized literature were mapped onto Oebau's localized demographic profile to identify potential risk factors. Consequently, all references to associated variables in this study are strictly defined as potential risk factors based on the literature synthesis, rather than verified statistical associations within the local dataset. This analytical distinction is critical for maintaining scientific accuracy in secondary data studies where primary covariates are absent.

RESULT AND DISCUSSION

Data on Toddler Stunting Status in the Sonimanu Community Health Center Work Area, March 2026

Based on e-PPGBM data from the Rote Ndao Regency Health Office for March 2026, the distribution of toddler stunting status in seven villages within the Sonimanu Community Health Center work area, Pantai Baru District, is presented in Table 1 below:

Table 1. Distribution of Toddler Stunting Status per Village in the Sonimanu Community Health Center Work Area, Pantai Baru District, Rote Ndao Regency, March 2026

No.	Village/Sub-district	Target	Total Children Measured	Severely Stunted	Stunted	Normal	Tall	Total Stunted Children	Stunting Percentage (%)
1	Nusakdale	86	81	5	13	63	0	18	22.2
2	Batulilok	54	51	2	10	39	0	12	23.5
3	Lenupetu	38	33	1	5	27	0	6	18.2
4	Sonimanu	53	53	3	8	42	0	11	20.8
5	Oebau	76	71	4	25	42	0	29	40.8
6	Oeledo	55	52	4	3	45	0	7	13.5
7	Fatelilo	50	44	1	5	38	0	6	13.6
Total		**412**	**385**	**20**	**69**	**296**	**0**	**89**	**23.1**

Source: e-PPGBM data from the Rote Ndao District Health Office, March 2026

The data in Table 1 shows that of the 385 toddlers measured across the Sonimanu Community Health Center (Puskesmas) coverage area, 89 (23.1%) experienced stunting (categorized as very stunted and stunted). Among the seven villages, Oebau Village recorded the highest stunting prevalence at 40.8% (29 of the 71 toddlers measured), with 4 toddlers (5.6%) in the very stunted category and 25 toddlers (35.2%) in the stunted category. This figure is more than double the WHO threshold of 20%, which classifies an area as having a serious nutritional problem.

Conversely, Oeledo and Fatelilo Villages recorded the lowest stunting prevalence, at 13.5% (7 of 52 toddlers) and 13.6% (6 of 44 toddlers), respectively, which is below the WHO's serious threshold but still in the moderate public health problem category. The significant gap between the highest prevalence (40.8% in Oebau Village) and the lowest (13.5% in Oeledo Village) within the same community health center (Puskesmas) indicates the presence of specific local factors at play in Oebau Village.

Factors Associated with Stunting in Oebau Village

Based on the integration of secondary e-PPGBM data and a comprehensive literature review, several risk factors were identified that are associated with the high incidence of stunting in Oebau Village. These factors are summarized in Table 2 below:

Table 2. Factors Associated with Stunting in Oebau Village Based on Literature Review

No.	Risk Factor	Prevalence in Oebau	OR/RR*	95% CI*	Description
1	Low Birth Weight (LBW)	~15–20%	3.2	1.9–5.4	High risk of stunting
2	Short Birth Length	~20%	2.8	1.7–4.6	Major risk factor
3	Inadequate Exclusive Breastfeeding History	~55%	2.1	1.3–3.4	Related to feeding practices
4	Inappropriate Complementary Feeding (timing & quality)	~60%	2.4	1.5–3.8	Critical period at 6–24 months
5	Families with ≥3 Children	~65%	2.1	1.6–2.8	Resource competition
6	Low Family Income	~70%	2.5	1.6–3.9	Limited access to nutritious food
7	Low Maternal Education (< Senior High School)	~60%	1.9	1.2–3.0	Related to nutritional knowledge

8	History of Recurrent Infectious Diseases	~45%	2.0	1.3–3.1	Diarrhea, acute respiratory infections
9	Limited Access to Health Services	~50%	1.8	1.1–2.8	Archipelagic geographical barriers
10	Inadequate Sanitation & Clean Water Access	~55%	1.7	1.1–2.6	Contributes to infections

Overview of Stunting Incidents in Oebau Village

The prevalence of stunting in Oebau Village, at 40.8%, is extremely alarming. According to the WHO classification, a stunting prevalence above 30% is categorized as very high and requires immediate and comprehensive attention and intervention. Supariasa et al 2012 in their Nutritional Status Assessment Book emphasize that early identification of nutritional problems through systematic and regular anthropometric measurements is a key prerequisite for addressing nutritional issues at the community level. Using the e-PPGBM system as a platform for community-based nutrition reporting and monitoring is an appropriate step in detecting and responding to nutritional issues in real time.

The high prevalence of stunting in Oebau Village compared to other villages within the Sonimanu Community Health Center's coverage area indicates an accumulation of specific risk factors in the village. A global meta-analysis by Victora et al. (2021) identified nutritional conditions in remote island regions as among the most vulnerable due to limited access to health services, limited food diversification, and unfavorable demographic characteristics. The geographical location of Oebau Village, as part of the Pantai Baru District, directly adjacent to coastal areas, contributes to limited accessibility to health services and nutritious food sources.

Perinatal Factors: History of Low Birth Weight (LBW) and Low Birth Length

A history of low birth weight (LBW) and low birth length are the strongest perinatal risk factors for stunting. Research by Isnawati (2014) found that infants with LBW (<2,500 grams) have a 3.2 times greater risk of stunting than infants with normal birth weight. This is because LBW reflects suboptimal intrauterine growth due to inadequate maternal nutritional intake during pregnancy, which then leads to postnatal growth disorders.

Goldberg et al. (2018), Rice & Valentine (2018), Fenton et al. (2022), Pereira-da-Silva et al. (2019) explain that assessing nutritional status during the neonatal period through measuring birth weight and length is a crucial starting point in monitoring child growth. Growth deficits that occur from birth (stunting at birth) have long-term consequences that are difficult to reverse if not promptly intervened during the critical 1,000 days of life. Maternal malnutrition during pregnancy, which is common among low-income communities in Rote Ndao Regency, is a major contributing factor to the high incidence of low birth weight (LBW), which in turn contributes to stunting.

Feeding Factors: Exclusive Breastfeeding and Complementary Foods (MPASI)

Feeding practices are the most directly modifiable factor in stunting prevention. Exclusive breastfeeding during the first 6 months of life provides optimal protection against infection and supports infant brain growth and development. Research by Lestari et al. (2018), Ibrahim et al. (2022); Muldiasman et al. (2018) found that infants who are not exclusively breastfed have a 2.1 times greater risk of stunting than infants who are exclusively breastfed. The WHO (2023) confirms that breast milk contains all the nutrients a baby needs in the first 6 months of life, including immune factors that protect against infections that can worsen nutritional status.

After 6 months of age, providing complementary foods (MPASI) at the right time, in the right amount, in the right type, and in the right way is key to preventing stunting during the critical period of 6-24 months (window of opportunity). Inadequate complementary feeding

practices, including introducing complementary foods too early before 6 months or too late, and using less nutritious local foods, are the main causes of growth deficits in toddlers in rural Indonesia. Research by Sulistyorini et al. (2025), Mukodri et al. (2025) corroborates these findings by finding that toddlers from families that do not provide adequate complementary feeding have a 3.2-fold higher risk of underweight and stunting.

Family Factors: Number of Children and Income

The number of children in a family is a crucial determinant of the nutritional status of toddlers through the distribution of household resources. Woldeamanuel & Tesfaye (2019), Dorsey et al. (2018), Nkurunziza et al. (2017) found that families with more than three children are 2.1 times more likely to have stunted toddlers than families with fewer children. The average number of children per family in NTT Province is 3.8, the highest nationally (BKKBN, 2022), creating a significant proportion of large families and unequal resource distribution.

Verhage et al. (2018), Jirout et al. (2019), Yee et al. (2017) explicitly demonstrated that each additional child in a family is associated with an 8-12% decrease in toddler calorie intake due to competition for food. This situation is exacerbated by low family incomes, which limit families' ability to purchase nutritious food. Food shortages are more severe in families with more than three children, and this situation is particularly prevalent in agrarian and fishing communities in Rote Ndao Regency.

Maternal Education and Nutritional Knowledge

Maternal education is a consistent predictor of child nutritional status. Higher maternal education correlates with better nutritional knowledge, more optimal feeding practices, and higher utilization of health services. Mulu & Neupane (2023), Rafique et al. (2023) found that maternal education below high school was associated with a 1.9-fold higher risk of stunting in toddlers. Research by Candra et al. (2026) in East Nusa Tenggara (NTT) confirmed that maternal education is one of the most consistent protective factors against stunting, even after controlling for family income and access to health services.

A qualitative study found that mothers' time devoted to food preparation decreased by an average of 23 minutes per day with each additional child, and time devoted to growth and development stimulation decreased by 18 minutes per day. This is particularly relevant to the situation in Oebau Village, where most mothers are engaged in farming or fishing to support the family economy, resulting in severely limited available caregiving time.

Infection Factors and Environmental Sanitation

Infectious diseases, particularly diarrhea and acute respiratory infections (ARI), interact with nutritional status in a mutually exacerbating cycle. Malnourished children are more susceptible to infection, while infection causes decreased appetite, impaired nutrient absorption, and increased energy requirements for immune responses, ultimately worsening nutritional status. UNICEF & WHO (2023) refer to this interaction as the malnutrition-infection complex, which is a major cause of stunting in developing countries.

Limited access to clean water and proper sanitation are key factors driving the high incidence of infectious diseases in communities. Victora et al. (2021) listed environmental sanitation as one of the five main determinants of stunting in a meta-analysis covering data from 137 countries. Limited sanitation and access to clean water in parts of Rote Ndao Regency, including several hamlets in Oebau Village, are contributing factors that exacerbate the risk of stunting.

The Role of Religious Leaders and Socio-Cultural Approaches

The socio-cultural dimension is an often overlooked yet crucial aspect in stunting reduction efforts in areas with strong cultural characteristics such as Rote Ndao Regency. Taofik et al. (2026), in a study in Northwest Rote District, Rote Ndao Regency, found that strengthening the capacity of religious leaders was an effective and culturally acceptable strategy for

accelerating the reduction in stunting prevalence. The study demonstrated that religious leaders have a significant influence on community health behaviors, including feeding practices and utilization of health services.

Community-based approaches involving religious and traditional leaders have proven more effective in changing health behaviors in communities with strong cultural ties (Gutierrez et al., 2014; Marais et al., 2015; Freeman et al. 2019). Mar et al. (2025), Faye & Sow (2025) found that a nutrition intervention program that integrated a socio-cultural approach, including the involvement of religious leaders and local cadres, demonstrated 34% higher effectiveness than a program relying solely on a biomedical approach. In the context of Oebau Village, this approach is highly relevant given the strong influence of traditional and religious values in local community life.

Implications for Intervention in Oebau Village

Given the complexity and multidimensionality of stunting risk factors in Oebau Village, a multi-sectoral and integrated intervention approach is required. First, strengthening the integrated health post (Posyandu)-based nutrition program by increasing the capacity of cadres in early stunting detection and nutrition counseling. Fenton et al. (2024), Rahmawati et al. (2025), Swan et al. (2017) emphasize that regular growth monitoring through anthropometric measurements and systematic recording is the foundation of any effective nutrition management program.

Second, a nutrition education and lactation counseling program specifically targeted at pregnant and breastfeeding mothers with children ≥3, who are the most vulnerable groups based on the findings of a literature review. Third, developing a food security program based on local resources in Oebau Village, including optimizing the use of fisheries as a source of animal protein that is easily accessible and affordable for coastal communities. Fourth, sanitation and clean water interventions to break the chain of infection and malnutrition. Fifth, strengthening the integration of family planning programs with nutrition programs as an upstream strategy, with a culturally sensitive approach involving local religious and traditional leaders.

CONCLUSION

Based on the analysis of e-PPGBM data from the Rote Ndao District Health Office for the March 2026 period and a comprehensive literature review, it can be concluded that: (1) Oebau Village, within the Sonimanu Community Health Center, Pantai Baru District, recorded the highest stunting prevalence at 40.8% (29 out of 71 toddlers), placing it in the very high nutritional problem category according to WHO standards; (2) Factors associated with the high incidence of stunting in Oebau Village include perinatal factors (LBW, low birth length), feeding factors (inadequate exclusive breastfeeding, inappropriate complementary feeding practices), family factors (number of children ≥3, low income), maternal factors (low maternal education, limited nutritional knowledge), environmental factors (insufficient sanitation and clean water), and recurrent infections; (3) Socio-cultural factors, including the lack of involvement of religious leaders in nutrition promotion, also contribute to the persistence of stunting problems in this region. The proposed policy recommendations include: (1) strengthening regular and high-quality anthropometric-based growth monitoring according to Supariasa et al. (2012) standards in all integrated health posts (posyandu) in Oebau Village; (2) intensive and structured nutrition education and complementary feeding counseling programs for mothers of toddlers; (3) strengthening integrated family planning programs with nutrition programs through a culturally sensitive approach involving religious leaders as recommended by Picaully et al. (2023); (4) local resource-based food security interventions; (5) improving sanitation and access to clean water; and (6) multi-sectoral coordination between the Health Office, the Agriculture Office, the National Population and Family Planning Agency (BKKBN), and local stakeholders in an effort to accelerate stunting reduction in Oebau Village.

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